

organisms as is desirable for the domestic science student. It is divided into five sections, dealing respectively with (a) morphology and classification; (b) cultivation and methods of investigation; (c) physiology; (d) fermentation; and (e) micro-organisms in relation to health and disease. The bacteria, yeasts, and moulds are considered at some length, and a chapter on parasitic Protozoa is included.

The chapters on general morphology and classification are particularly good, and a clear account is furnished of the distinguishing features of the various groups. In an appendix an illustrated key is given of the families and genera of the common moulds; this will be found most useful in the laboratory by other than domestic science students.

The brief description of the optics of the immersion system of lenses is correct, so far as it goes, but a paragraph should have been inserted pointing out that the great advantage of this system is the increased resolution obtained thereby.

The chapter on food preservation is a useful summary of the subject, but might have been extended with advantage.

The chapters on the nitrogen cycle in nature, alcoholic and other fermentations, enzyme action, and the ripening of certain foods are all satisfactory and convey a considerable amount of coordinated information on these important aspects of microbiology.

Much space (140 pages) is devoted to a consideration of disease and disease-producing micro-organisms, vegetable and protozoal. We think this section could have been somewhat curtailed with advantage, having regard to the avowed limitation of the book; and the space so gained might then have been devoted to a fuller consideration of certain aspects of household microbiology. Such criticisms as have been offered are those of detail, but the book as a whole is an excellent one. It is profusely and well illustrated, and can be strongly recommended not only to the domestic science student, but to a wider public.

R. T. HEWLETT.

Aus Süd-Brasilien. Erinnerungen und Aufzeichnungen. By Dr. W. Breitenbach. Pp xvi+251. (Brackwede i. W.: Dr. W. Breitenbach, 1913.) Price 3 marks.

THE author has lived in southern Brazil for several years in order to observe the land and the people, especially the German colonies, and beginning in the year 1884, he has since described his observations in more than thirty newspaper articles, essays, and separate pamphlets. Considering the changes which have come about in Brazil within the last thirty years, this book does not pretend to deal with present-day questions of commerce, industry, and general development, or with the colonisation scheme, which, of course, has undergone complete modifications. His personal experiences, narratives of various journeys, are also omitted, having been described elsewhere. It is, therefore, not very obvious why these "reminiscences and notes" should be published now.

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The fragmentary chapters on minerals, fauna, and flora are poor. Others, written in the easy, fluent style of feuilletons or causeries, deal with the life in towns, chiefly Porto Alegre, the capital of South Brazilian Germans, whose customs, modes of assimilation, ideals, and successes are compared with those of the Brazilians.

LETTERS TO THE EDITOR.

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Branch Product in Actinium C.

It is now well established that the atoms of radium C and thorium C can break up in two distinct ways, i.e., with the expulsion of either an α or a β particle. It is to be expected from the close analogy between the C products of the various radio-active families that actinium C should also show abnormal disintegration, and, further, it might be anticipated that one of the branch products would emit an α particle with great velocity and corresponding long range. We have made experiments to test this point. A source of actinium active deposit was covered with a sheet of mica equivalent to about 5 cm. air in stopping power of α particles, and the whole placed in an exhausted chamber with a zinc sulphide screen about 2 cm. from the source. The numbers of scintillations appearing on the screen per minute for different pressures of the air inside the apparatus were counted, and thus the falling off of the α particles with "range" determined. The results showed that in addition to the α particles of actinium C with range 5.4 cm., a small number, about 1 in 600, can penetrate as far as about 6.45 cm. Special experiments showed that the long-range α particles could not be due to radium or thorium impurity, and they must therefore be attributed to the expected new branch product.

In connection with this question, it should be noticed that Mme. Blanquies, in 1910, inferred the existence of two α -ray products in the active deposit of actinium from the shape of the Bragg ionisation curve. The small fraction of long-range α particles found in our experiments, viz., 1 in 600, is, however, quite insufficient to be reconciled with her results. We are therefore repeating her experiments.

E. MARSDEN.

R. H. WILSON.

University of Manchester, September 3.

The Terrestrial Distribution of the Radio-elements and the Origin of the Earth.

IN NATURE of June 19 and August 7, 1913, Mr. Holmes, in two interesting letters, shows on the basis of the planetesimal hypothesis how a concentration of the radio-elements might possibly take place in the earth's crust with their absence at depth to satisfactorily account for the observed temperature gradient of the earth; and in his latest communication he indicates how the inhibition of radio-activity by pressure might bring about the same result. But the terrestrial distribution of these elements seems to be of further importance in that it may enable us to determine whether our earth had a stellar or a planetesimal origin.

On the stellar hypothesis, the earth would be partly developed by a process of oxidation—practically the same as that by which we manufacture steel from

impure cast-iron at the present day—and whereby all the impurities would be removed to the surface to form the primal crust. The first of this primal crust would be the most acidic, and the last the most basic; and in the metallic core left, even the oxygen which had been the means of removing all the impurities would itself be undetectable. Thorium is but a higher member of the silicon (carbon) family as uranium is of the oxygen family, and the conditions which remove the lower members should be effective in removing the higher ones also. So, too, it seems only natural that the most acidic rocks—that is, the rocks containing the greatest proportions of silicon and of oxygen—should at the same time be associated with the greatest proportions of thorium and of uranium, which are but the highest members of the silicon and oxygen families.

On the planetesimal hypothesis a similar distribution of the radio-elements can hardly be imagined. To get a metallic core that shall be free from thorium and uranium, we have to imagine the planetesimals undergoing individually the oxidation process which has just been sketched, unless the planetesimals happened to be fragments of a preformed stellar mass. Provided all went well, when these planetesimals were piling themselves together to form the earth, the result would be a metallic core free from thorium and uranium, but surrounded by a crust in which these elements would be uniformly distributed. As the acidic rocks differ only in degree from the basic rocks, it would be impossible for the former to rise up through miles of a mixture of both to form an acidic layer, as happens in the case of a stellar earth. Subsequent aqueous action is relatively negligible in both cases.

It is probably the exigencies of the planetesimal hypothesis that constrain Mr. Holmes to state that there is "clearly a marked antipathy between the radio-elements and native iron, for in all the terrestrial examples which have been examined uranium and thorium are barely detectable." As a matter of fact, these elements alloy with iron and nickel, which are the constituents of native iron; and their marked absence is a proof that native iron had undergone an oxidation process at one time in its history, and so had its thorium and uranium removed.

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GEORGE CRAIG.

THE INTERNATIONAL UNION FOR SOLAR RESEARCH.

THE fifth conference of the International Union for Cooperation in Solar Research was held at Bonn, by invitation of Prof. Kayser, from July 31 to August 5. The attendance was about 100, including delegates from nearly every country in Europe, and a large contingent from America. In the absence of Prof. Hale and Dr. Schuster, through sickness, the executive committee was ably represented by Prof. Turner. As on former occasions, the chief business at the general meetings was to receive and discuss the reports of the various committees appointed for the organisation of observations and methods of reduction.

An important part of the work of the union has been that relating to standards of wave-length. At the last meeting, held at Mount Wilson, California, in 1910, it was believed that a final set of standards was well within sight, but further investigations have revealed unexpected difficulties. It has, in fact, been found by Goos and others that the wave-lengths of many of the iron lines vary

slightly with the length of the arc and the portion of the arc observed. Fortunately, most of the lines already adopted as secondary standards, from interferometer determinations, preserve their positions under a variety of circumstances, but they are not sufficient in number. Hence, it has become necessary to attempt the definition of a standard iron arc for determinations of further standards, and for the production of reference spectra to be used in the determination of wave-lengths by interpolation. The committee recommended the following specification for the iron arc: (1) Length of arc, 6 mm. (2) For lines of wave-length greater than 4000, current to be 6 amperes, and for lines of shorter wave-length 4 amperes, or possibly less. (3) Direct current, positive pole above negative, P.D. of 220 volts, electrodes being iron rods of 7 mm. diameter. (4) An axial portion of the arc, at its middle, about 2 mm. in length, to be used as the source of light. Cooperation in the determination of tertiary standards is desired from all who possess concave gratings, plane gratings, or prisms of sufficient dispersion and resolving power, and to this end it is recommended that additional secondary standards be determined with the interferometer, so that the interpolation method may be used with greater exactness.

At the Mount Wilson meeting a committee on the determination of the solar rotation by means of the displacements of lines was formally organised, and a programme of research agreed upon. Each cooperating observer undertook observations, at specified latitudes, in a definite region of the spectrum, in addition to a control region common to all the observers, and lines were to be selected so as to include elements of widely different atomic weights. It now appears that different observers may obtain results differing systematically by as much as 10 per cent. from one another, and that serious discrepancies have also been found in the results obtained by different observers from measurements of the same photographs. The committee accordingly recommended that, before proceeding further, investigations of these sources of error should be made by determinations of velocity at the solar equator by as many different methods as possible.

Satisfactory progress in work with the spectroheliograph was reported, but the Committee hoped that additional observatories would install instruments of high dispersion, in order that filaments and alignments in the upper atmosphere might be more completely recorded. As the result of representations made by Prof. Ricco and by the Royal Astronomical Society, the title of the spectroheliograph committee was changed to "Committee on Solar Atmosphere," so as to include and unify all the observations on the solar atmosphere, visual and photographic, except those associated with eclipses. The organisation directed by Prof. Ricco, and other observers of prominences, were thus given the opportunity of closer connection with the union. After some discussion, a sub-committee for visual observations of prominences and related phenomena was appointed, with Prof.